

Configuring Cell-Mode MPLS on IOS Platforms

Overview

The chapter details the cell-mode IOS MPLS implementation, giving detailed configuration, monitoring and debugging guidelines. It also covers configuration of MPLS on IOS-based ATM platforms (routers; Lightstream 1010, Catalyst 8510 and Catalyst 8540 ATM switches).

It includes the following topics:

- Configuring and Monitoring Label-Controlled ATM (LC-ATM) Multiprotocol Label Switching (MPLS)
- Configuring LC-ATM MPLS over ATM Virtual Path (VP)
- Monitoring LC-ATM MPLS on IOS platforms

Objectives

Upon completion of this chapter, you will be able to perform the following tasks:

- Configure cell-mode MPLS on ATM interfaces on IOS platforms
- Configure cell-mode MPLS on ATM Virtual Path on IOS platforms
- Monitor and troubleshoot cell-mode MPLS on IOS platforms

Configuring and Monitoring LC-ATM MPLS

Objectives

Upon completion of this section, you will be able to perform the following tasks:

- Configure Tag Switching and MPLS on router LC-ATM interfaces
- Configure Tag Switching and MPLS on IOS-based ATM switches

Configuring MPLS on LC-ATM Interfaces

Configuration tasks on routers:

- Create an LC-ATM subinterface
- Enable TDP/LDP on the subinterface

Configuration tasks on Catalyst 8510/8540

- Configure Tag Switching or MPLS on the ATM interface

Common optional configuration tasks

- Configure additional LC-ATM parameters

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The configuration of cell-mode MPLS differs from frame-mode. There is an additional command that specifies the type of the subinterface. Instead of enabling point-to-point or multipoint the interface is set to tag-switching mode (this enables cell-mode MPLS instead of the default frame-mode).

Once the ATM subinterface type is specified use the MPLS configuration commands to enable MPLS on the interface. MPLS type (cell-mode versus. frame mode) is determined from the type of subinterface.

Note On ATM switches there is no need for an additional command because they only run cell-mode MPLS.

Configuring LC-ATM Interface on a Router

```
router(config)#
```

```
interface atm number.sub-number tag-switching
```

- Creates an LC-ATM subinterface
- By default, this subinterface uses VC 0/32 for label control protocols and VP=1 for label allocation

```
router(config-if)#
```

```
tag-switching ip
```

```
mpls ip
```

```
12.1(3)T
```

```
mpls label-protocol [ ldp | tdp | both ]
```

```
12.2T
```

- Enables MPLS on an LC-ATM subinterface
- Starts LDP or TDP on an LC-ATM subinterface

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On IOS routers subinterfaces are typically used. Use the **tag-switching** keyword to specify the type of subinterface when entering interface configuration mode. This command specifies that cell-mode MPLS should be used instead of frame-mode.

Use the MPLS configuration command **mpls ip** to actually enable MPLS.

After using both commands the router will create the control virtual circuit with VPI/VCI=0/32 to establish an IP adjacency with the directly connected ATM switch. This VC is used for TDP or LDP and the routing protocol used in the network.

Optionally, the label distribution protocol can be changed. By default, Cisco routers use TDP. There should be no need to enable both protocols since there is only one device on the other side of this link.

tag-switching ip

To enable tag switching of IPv4 packets on an interface, use the **tag-switching ip** interface configuration command. To disable IP tag switching on an interface, use the **no** form of this command.

tag-switching ip

no tag-switching ip

Defaults

This feature is disabled by default.

mpls ip

This command has the same function as **tag-switching ip**.

mpls label-protocol [tdp | ldp | both]

To select the label distribution protocol to be used on an interface, use the **mpls label-protocol** command. Use the **no** form to revert to the default label distribution protocol.

mpls label-protocol <protocol>
no mpls label-protocol <protocol>

Syntax Description

This command has one argument:

| | |
|-------------|-------------------------------------|
| <i>tdp</i> | enables TDP on an interface |
| <i>ldp</i> | enables LDP on an interface |
| <i>both</i> | enables TDP and LDP on an interface |

Defaults

Tag Distribution Protocol is the default protocol.

Configure LC-ATM Interface on a Catalyst ATM Switch

router(config)#

| | |
|---|----------|
| interface atm <i>number</i> | |
| tag-switching ip | |
| mpls ip | 12.1(3)T |
| mpls label-protocol [ldp tdp both] | 12.2T |

- Enables LC-ATM control on an ATM interface
- Starts LDP or TDP on the interface
- Default control VC=0/32, label allocation uses VP=1

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Use these commands to enable MPLS on an interface of a Catalyst ATM switch—cell-mode MPLS is implied. Enabling both distribution protocols can be useful in a mixed environment when the supported protocol for every device connected to the switch does not need to be determined.

Once the TDP/LDP adjacency is established (over virtual circuit 0/32) the devices start negotiating LVCs. By default, all LVCs use VPI value 1.

tag-switching ip

To enable tag switching of IPv4 packets on an interface, use the **tag-switching ip** interface configuration command. To disable IP tag switching on an interface, use the **no** form of this command.

tag-switching ip
no tag-switching ip

mpls ip

This command has the same function as **tag-switching ip**.

mpls label-protocol [tdp | ldp | both]

To select the label distribution protocol to be used on an interface, use the **mpls label-protocol** command. Use the **no** form to revert to the default label distribution protocol.

mpls label-protocol <protocol>
no mpls label-protocol <protocol>

Syntax Description

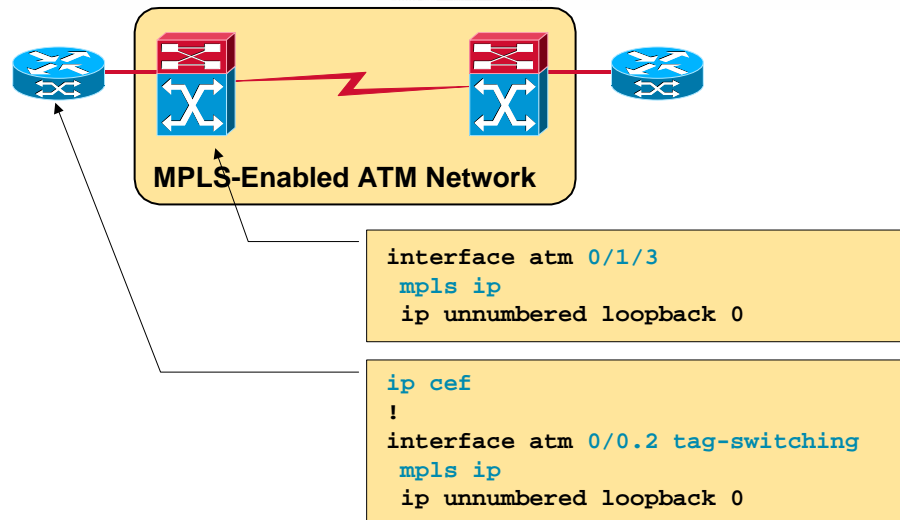
This command has one argument:

| | |
|-------------|-------------------------------------|
| <i>tdp</i> | enables TDP on an interface |
| <i>ldp</i> | enables LDP on an interface |
| <i>both</i> | enables TDP and LDP on an interface |

Defaults

Tag Distribution Protocol is the default protocol.

Basic LC-ATM Configuration



To enable cell-mode MPLS between a router and a switch ensure that the router uses the tag-switching type for the subinterface.

To successfully establish label distribution session both devices need to use the same protocol (TDP or LDP). Both devices should use the same parameters for the control VC (default VPI/VCI=0/32). There should be an intersection between the proposed ranges of VPI and VCI values.

By default, all Cisco devices use VPI value 1 for dynamically established LVCs. Additionally, Cisco routers require CEF switching to enable MPLS.

Configuring Additional LC-ATM Parameters

router(config)#

no tag-switching vc-merge

- VC-merge is enabled by default on all ATM switches that support VC-merge functionality
- This command disables VC-merge

router(config)#

tag-switching atm maxhops *max-hops*

- Configures the maximum hops value for downstream-on-demand LDP/TDP loop detection

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tag-switching vc-merge

A large ATM network using cell-mode MPLS may experience a problem of having too many LVCs. MPLS itself is very similar to ATM but it normally merges multiple sources into one destination (label). This is an unusual situation for ATM and would cause mixing of cells belonging to different packets. The end device that needs to reassemble the cells into a packet would not be able to differentiate between cells because they use the same VPI/VCI value pair. There are two solutions:

- Create a distinct label for every source-destination pair (may require a large number of LVCs)
- Merge multiple sources to use the same destination label, by buffering the incoming cells in the ATM switch and forwarding them when the complete frame has been assembled. This option is called **vc-merge**.

VC-merge is enabled by default on all devices that support it, and must be explicitly disabled if it is not desired.

Note The ATM switch that does the **vc-merge** function buffers the entire AAL5 frames as they are received, then forwards them contiguously, without mixing cells. The end device therefore has no problem reassembling each individual frame correctly. The drawback of using **vc-merge** is the increased store-and-forward delay incurred by the ATM switch

Note VC merge support requires FC-PFQ on the route processor of Lightstream 1010 or Catalyst 8510 MSR. If you do not have FC-PFQ, and you try to enable VC merge, the LVCs remain point-to-point.

Command Syntax

To control whether vc-merge (multipoint-to-point) is supported for unicast tag VCs, use the **tag-switching atm vc-merge** global configuration command. Use the **no** form of this command to disable this feature.

tag-switching atm vc-merge
no tag-switching atm vc-merge

Defaults

Enabled.

tag-switching atm maxhops

Router ID can be used in LDP to detect routing information loops in ATM networks during the downstream-on-demand label allocation process. TDP does not support this option and relies exclusively on hop-count carried in the TDP request and reply packets to detect loops during the downstream-on-demand label allocation. You can configure the maximum number of hops allowed during a TDP or LDP label allocation by using **tag-switching atm maxhops** command global configuration command. Use the **no** form of this command to ignore the hop count.

tag-switching atm maxhops [number]
no tag-switching atm maxhops

Syntax Description

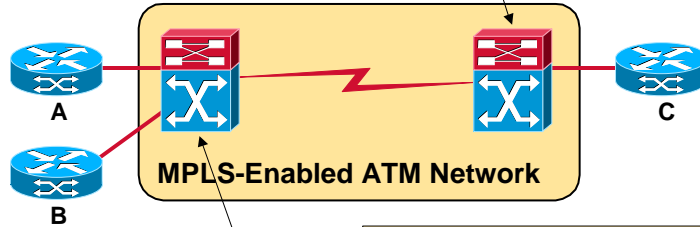
number (Optional) Maximum hop count.

Defaults

Unlimited.

Disabling VC-Merge

no tag-switching vc-merge



no tag-switching vc-merge

- VC-merge is enabled by default on switches supporting it
- VC-merge prevents interleaving of cells toward a common destination when they traverse the ATM network
- VC-merge has to be disabled to allow cell interleaving

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The VC-merge feature is enabled by default on all switches that support it. If for some reason the feature is not required (that is, small network, different line speeds, buffering not desired) it can be disabled. Disabling vc-merge results in the ability to interleave cells, but must create an LVC for every source-destination pair.

Configuring Additional LC-ATM Parameters

router(config-if)#

tag-switching atm control-vc *vpi vci*

- Configures control VC between LC-ATM peers
- Default value is 0/32
- The setting has to match between LC-ATM peers

router(config-if)#

tag-switching atm vpi *start-vpi [- end-vpi]*

- Configures the Virtual Path values that can be used for label allocation
- Default value is 1-1 (only VP value 1 is used)
- LC-ATM peers need at least some overlapping VP values to start a TDP/LDP session

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Use the **tag-switching atm control-vc** to change the default VPI and VCI numbers used for the control VC. Use the **tag-switching atm vpi** commands to change the default VPI values for the LVCs.

tag-switching atm control-vc

To configure the VPI and VCI to be used for the initial link to the Tag Switching peer device, use the **tag-switching atm control-vc** interface configuration command. The initial link is used to establish the TDP session and to carry non-IP traffic. To clear the interface configuration, use the **no** form of this command.

tag-switching atm control-vc *vpi vci*

no tag-switching atm control-vc *vpi vci*

Syntax Description

vpi Virtual path identifier.

vci Virtual channel identifier.

Defaults

Control VC uses VPI/VCI value pair 0/32.

tag-switching atm vpi

To configure the range of values to use in the VPI field for tag VCs, use the **tag-switching atm vpi** interface configuration command. To clear the interface configuration, use the **no** form of this command.

tag-switching atm vpi *vpi [- vpi]*

no tag-switching atm vpi vpi [- vpi]

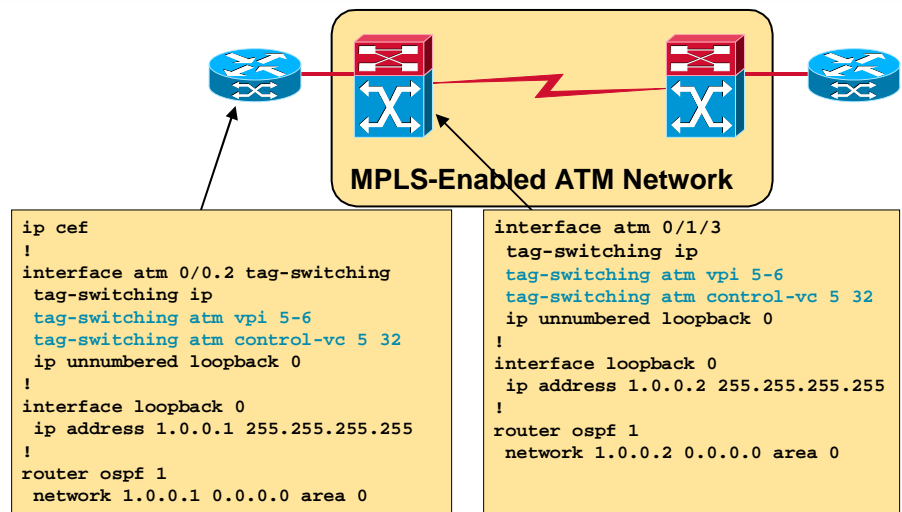
Syntax Description

vpi Virtual path identifier (low end of range).
- *vpi* (Optional) Virtual path identifier (high end of range).

Defaults

VPI value 1 is used for LVCs.

Configuring MPLS on Virtual Paths 5 and 6



The example above shows how to change the default VPI range from 1-1 to 5-6. The control VC can also use the VPI value used for LVCs. In this example the control VC is using VPI=5 and VCI=32. Note that the values much match on each neighbor.

Summary

The configuration of cell-mode MPLS is similar to that of frame-mode MPLS. The main differences are:

- Setting the type of ATM interface to tag-switching (on routers it enables cell-mode MPLS)
- Some ATM specific parameters are accessed through **tag-switching atm** commands (routers and switches), for example: control VC, VPI range, VC-merge and the maximum number of hops across the ATM network.

Lesson Review

1. What are the steps needed to configure an LC-ATM interface on a router?
2. What are the steps needed to configure an LC-ATM interface on an ATM switch?
3. Which additional LC-ATM parameters can you configure?

Configuring LC-ATM MPLS over ATM Virtual Path

Objectives

Upon completion of this section, you will be able to perform the following tasks:

- Identify the scenarios where it might be advantageous to run MPLS over ATM Virtual Path (VP)
- Describe the potential router – switch combinations that support MPLS over ATM VP
- Configure MPLS over ATM VP

Introduction to ATM Virtual Path

- **ATM Virtual Path was designed to establish switch-to-switch connectivity between parts of a private ATM network over a public ATM network**
- **The same concept can be used to link two LC-ATM domains across a public network**
- **Public network switches all cells belonging to a path, and the ATM LSRs at each end of the path establish individual virtual circuits inside the path using LC-ATM procedures**

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A virtual path is a collection of virtual circuits with a common VPI. ATM switches are forwarding cells based on VPI value only (VCI is ignored). This is useful if one or more switches in the network do not support MPLS. A static virtual path can be established between switches that support MPLS. They can establish a control VC across the virtual path and negotiate LVCs with the virtual path's VPI used to set the label range.

This solution is typically used when a public ATM network is used to interconnect remote sites that use ATM switches.

ATM Virtual Path Usages

Connecting two LC-ATM domains across a public network

- ATM PVC can be used to link two routers
- ATM virtual path has to be used to link an ATM switch to another switch or a router

Network migration toward IP+ATM

- Parts of the network already migrated can be linked with virtual paths during the transition period

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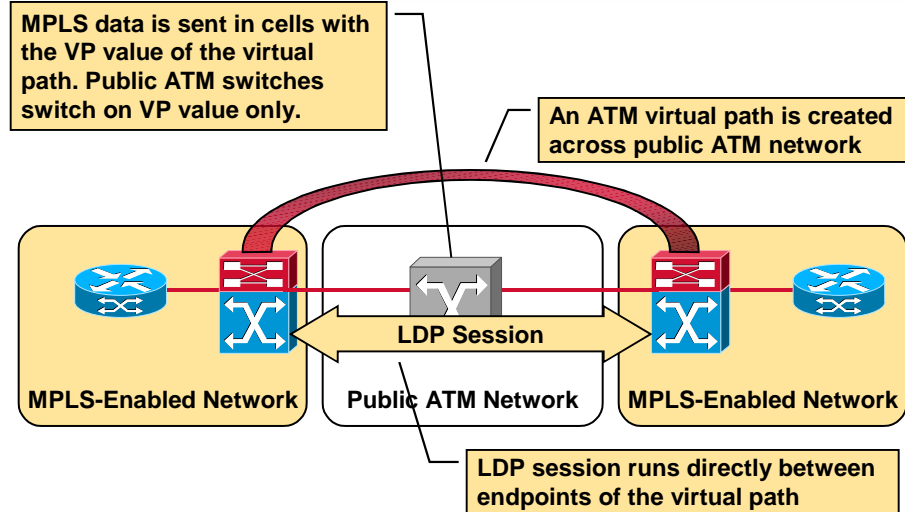
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There are two options when trying to enable MPLS across a public ATM network:

- Virtual circuit—frame-mode MPLS has to be used because ATM switches in the path do not support MPLS. Only routers support frame-mode MPLS. Switches cannot use frame-mode MPLS and, therefore, cannot use virtual circuits.
- Virtual path—cell-mode MPLS can be used between routers or switches on both ends of the virtual path.

Virtual paths can also be used in the migration stages when sites are being reconnected to MPLS-enabled switches. Virtual paths can be established from an MPLS-enabled switch to all devices connected to ATM switches that do not support MPLS. The network can then slowly be migrated towards IP+ATM without the need for an “overnight” full migration.

ATM Virtual Path Example



To enable cell-mode MPLS across a virtual path, the control VC should be changed to use the VPI of the virtual path. A router or a switch will then establish an adjacency with a router or a switch on the other end of the virtual path.

Note It is mandatory that the same VPI be used on both ends of the path because the VPI value is part of the LDP VP-range negotiation.

ATM Virtual Path Usage Scenarios

The following combinations are supported:

- **ATM switch to ATM switch**
- **ATM switch to a router**
- **Router to router (not advisable; use frame-mode MPLS over ATM PVC instead)**

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A virtual path can be used to connect any pair of devices across a public ATM network:

- Switch to switch
- Switch to router
- Router to router (PVCs with frame-mode MPLS are usually used in this case)

The first two options allow MPLS to run across a public ATM network. The third option can also be used but it has no advantage over using frame-mode MPLS across a PVC. On the contrary it requires a reservation of a large number of virtual circuits (virtual path equals 65536 virtual circuits).

Configuring MPLS over ATM Virtual Path - Switches

- ATM Virtual Path is configured on an ATM interface
- An MPLS-enabled subinterface is created. The Virtual Path number equals the subinterface number
- The Virtual Path number has to match between peers

```
! Configure LC-ATM MPLS over VP 17
!  
interface atm 0/1/3  
  atm pvp 17  
!  
interface atm 0/0.17 point-to-point  
  ip unnumbered loopback 0  
  tag-switching ip
```

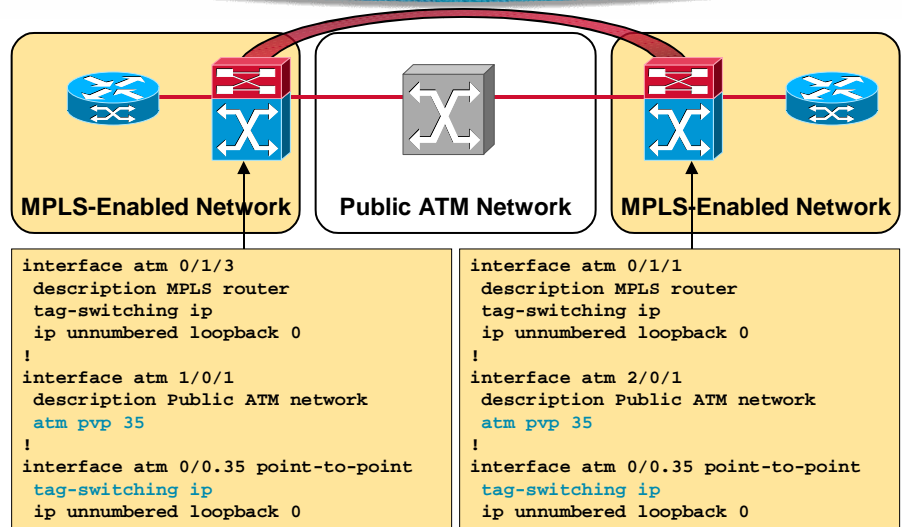
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In this example a virtual path with VPI=17 is created and a subinterface with the VPI number as the subinterface number is configured with cell-mode MPLS functionality.

ATM VP Switch-to-Switch Example



This example shows the configuration of both MPLS-enabled ATM switches connected by a virtual path across a public ATM network.

The VPI value has to be the same on the first and last hop in the path. The ATM provider can use any VPI on any other link.

Note This example does not change the parameters of the control VC. An additional PVC needs to be established for the control VC (0/32).

Configuring MPLS over ATM Virtual Path - Routers

- An LC-ATM interface is created
- The ATM VPI value is set to the Virtual Path number
- Control VC needs to be established within the Virtual Path
- The Virtual Path number has to match between peers

```
!  
! Configure LC-ATM tag switching over VP 17  
!  
interface atm 0/0.2 tag-switching  
  ip unnumbered loopback 0  
  tag-switching atm control-vc 17/32  
  tag-switching atm vpi 17-17  
  tag-switching ip
```

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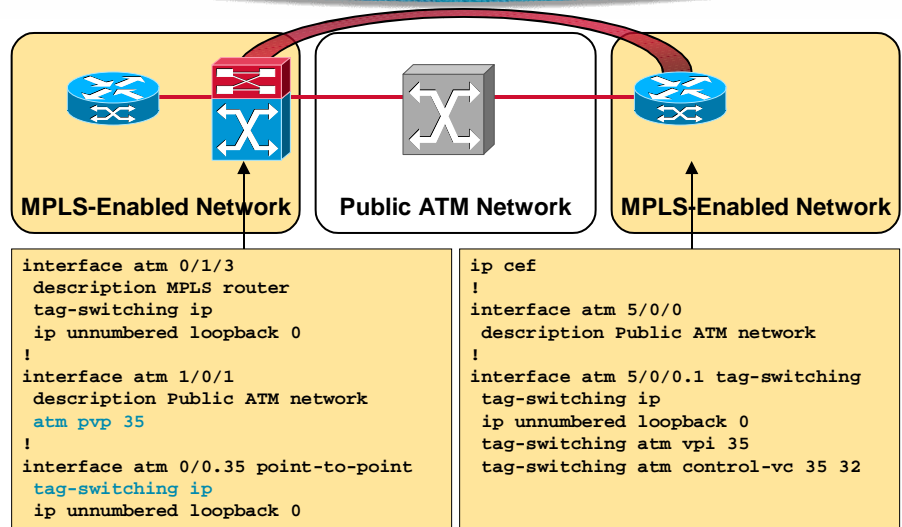
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To simplify the provisioning of the connection across a public ATM network the control VC can also be put into the virtual path.

The example above shows how the control VC can be changed to use the same VPI value used to establish the virtual path.

If the public network is forwarding cells for VPI=17 then the control VC should be put into this virtual path (17/32) and the label range has to be set to use the same VPI value (17-17).

ATM VP Switch-to-Router Example



When connecting a router and a switch through a virtual path only the parameters for the control VC and the label range on the router need to be set. The router is unaware that the control VC is not terminated on the directly connected switch. The public ATM network simply forwards all cells based on the VPI value to the other endpoint where an MPLS-enabled switch continues forwarding based on VPI and VCI values.

Summary

Virtual path is useful when trying to cross an ATM network that does not support MPLS. This is typically used when migrating from standard ATM to IP+ATM or when interconnecting sites across a public ATM network.

A virtual path can be established between two switches or a router and a switch. It is not recommended connecting two routers with a virtual path.

Configuration of a switch requires a PVP configuration. Configuration of a router does not require anything special (virtual path is transparent).

Lesson Review

1. Why would you deploy cell-mode MPLS over an ATM virtual path?
2. How does the MPLS work over an ATM virtual path?
3. Which router/switch combinations are supported across an ATM virtual path?
4. What could be an alternate method of connecting two routers across public ATM network?
5. What are the steps needed to configure an ATM virtual path?
6. Why does the ATM virtual path number have to match between LC-ATM peers?

Monitoring LC-ATM MPLS on IOS Platforms

Objectives

Upon completion of this section, you will be able to perform the following tasks:

- Describe procedures for monitoring MPLS over LC-ATM interfaces on IOS platforms
- List the debugging commands associated with label switching, LDP, and TDP on LC-ATM interfaces

Monitoring LC-ATM Specific Label Switching Functions

router(config)#

show tag-switching atm-tdp summary

- Displays the summary of ATM-TDP

router(config)#

show tag-switching atm-tdp bindings

- Displays ATM-TDP TIB

router(config)#

show tag-switching atm-tdp capabilities

- Displays the LC-ATM capabilities of this LSR and peering LC-ATM LSRs

Several other commands display labels in ATM format.

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There are commands similar to **show tag-switching tdp** that display ATM specific parameters. Use a question mark to see all subcommands of **show tag-switching atm-tdp**.

show tag-switching atm-tdp summary

To display summary information on ATM tag bindings, use the **show tag-switching atm-tdp summary** privileged EXEC command.

show tag-switching atm-tdp summary

show tag-switching atm-tdp bindings

To display the requested entries from the ATM TDP tag-binding database, use the **show tag-switching atm-tdp bindings** privileged EXEC command.

show tag-switching atm-tdp bindings [*network* {*mask* | *length*}] [**local-tag** | **remote-tag** *vpi vci*] [**neighbor** *intf*] [**remote-tag** *vpi vci*]

Syntax Description

| | |
|----------------------------------|---|
| <i>network</i> | Destination prefix. |
| <i>mask</i> | Destination netmask prefix. |
| <i>length</i> | Netmask length, in the range of 1 to 32. |
| local-tag <i>vpi vci</i> | Selects tag values assigned by this switch. |
| neighbor <i>intf</i> | Selects tags assigned by a neighbor on the specified ATM interface. |
| remote-tag <i>vpi vci</i> | Selects tag values assigned by another switch. |

show tag-switching atm-tdp capability

To display the ATM TDP tag capabilities for all interfaces, use the **show tag-switching atm-tdp capability** privileged EXEC command.

Show Tag ATM-TDP Summary

```
Router#show tag-switching atm-tdp summary
Total number of destinations: 788
TC-ATM bindings summary
interface  total    active    bindwait  local    remote    other
ATM0/0/0   594      592       1         296     298       1
ATM0/0/1   590      589       0         294     296       1
ATM0/0/2   1179     1178      0         591     588       1
ATM0/0/3   1177     1176      0         592     585       1
ATM0/1/0   1182     1178      4         590     588       0
Waiting for bind on ATM0/0/0 10.21.0.0/24
```

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To display summary information on ATM tag bindings, use the **show tag-switching atm-tdp summary** privileged EXEC command.

Show tag-switching atm-tdp summary field description

| | |
|-------------------------------------|---|
| <i>Total number of destinations</i> | The number of known destination address prefixes. |
| <i>interface</i> | The name of an interface with associated ATM tag bindings. |
| <i>total</i> | The total number of ATM tags on this interface. |
| <i>active</i> | The number of ATM tags in an "active" state that are ready to use for data transfer. |
| <i>bindwait</i> | The number of bindings that are waiting for a tag assignment from the neighbor TSR. |
| <i>local</i> | The number of ATM tags assigned by this TSR on this interface. |
| <i>remote</i> | The number of ATM tags assigned by the neighbor TSR on this interface. |
| <i>other</i> | The number of ATM tags in a state other than "active" or "bindwait". |
| <i>Waiting for bind on ATM0/0/0</i> | A list of the destination address prefixes (on a particular interface) that are waiting for ATM tag assignment from the neighbor TSR. |

Show Tag ATM-TDP Bindings

```
Router#show tag-switching atm-tdp bindings
Destination: 6.6.6.6/32
    Tailend Switch ATM0/0/3 1/34 Active -> Terminating Active
Destination: 150.0.0.0/16
    Tailend Switch ATM0/0/3 1/35 Active -> Terminating Active
Destination: 4.4.4.4/32
    Transit ATM0/0/3 1/33 Active -> ATM0/1/1 1/33 Active
```

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Show tag-switching atm-tdp bindings field description

Destination 6.6.6.6/32

Destination IP address/length of netmask.

Tailend Switch

VC type:

- Tailend—VC that terminates at this switch
- Headend—VC that originates at this switch
- Transit—VC that passes through this switch

ATM0/0/3

ATM interface.

1/34

VPI/VCI

Active

TVC state:

- Active—Set up and working
- Bindwait—Waiting for response

Show Tag ATM-TDP Capability

```
Router#show tag atm-tdp capability
```

| | VPI | VCI | Alloc | Odd/Even | VC Merge |
|------------|-------------|--------------|--------|----------|----------|
| | Range | Range | Scheme | Scheme | IN OUT |
| ATM0/1/0 | | | | | |
| Negotiated | [100 - 101] | [33 - 1023] | UNIDIR | | - - |
| Local | [100 - 101] | [33 - 16383] | UNIDIR | | EN EN |
| Peer | [100 - 101] | [33 - 1023] | UNIDIR | | - - |
| ATM0/1/1 | | | | | |
| Negotiated | [201 - 202] | [33 - 1023] | BIDIR | | - - |
| Local | [201 - 202] | [33 - 16383] | UNIDIR | ODD | NO NO |
| Peer | [201 - 202] | [33 - 1023] | BIDIR | EVEN | - - |

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The **show tag-switching atm-tdp capability** command shows information about the negotiation of MPLS parameters with TDP/LDP neighbors:

- The first line shows the negotiated (active) parameters
- The second line shows the parameters proposed by this router
- The third line shows the parameters proposed by the neighbor

Note Neighbors need to have an intersection in their proposed VPI/VCI label ranges.

Show tag-switching atm-tdp capability field description

| | |
|---------------------|---|
| <i>VPI Range</i> | Minimum and maximum number of VPIs supported on this interface. |
| <i>VCI Range</i> | Minimum and maximum number of VCIs supported on this interface. |
| <i>Alloc Scheme</i> | <p>UNIDIR—Unidirectional capability indicates that the peer device can, within a single VPI, support binding of the same VCI to different prefixes on different directions of the link.</p> <p>BIDIR—Bidirectional capability indicates that within a single VPI, a single VCI can appear in one binding only. In this case, one peer device allocates bindings in the even VCI space, and the other in the odd VCI space. The system with the lower TDP identifier will assign even-numbered VCIs.</p> |

| | |
|-----------------------|--|
| | The negotiated allocation scheme is UNIDIR, if and only if, both peer devices have UNIDIR capability. Otherwise it is BIDIR. |
| <i>Odd/Even Schem</i> | Indicates whether the local device or the peer device is assigning an odd- or even-numbered VCI when the negotiated scheme is BIDIR. It does not display any information when the negotiated scheme is UNIDIR. |
| <i>VC Merge</i> | <p>Indicates the type of VC merge support on this interface.</p> <p>IN—Indicates input interface merge capability. IN accepts the following values:</p> <ul style="list-style-type: none"> ■ EN—The hardware interface supports VC merge and VC merge is enabled on the device. ■ DIS—The hardware interface supports VC merge and VC merge is disabled on the device. ■ NO—The hardware interface does not support VC merge. <p>OUT—Indicates output interface merge capability. OUT accepts the same values as the input merge side.</p> <p>The VC merge capability is meaningful only on ATM switches. It is not negotiated.</p> |
| <i>Negotiated</i> | Set of options that both TDP peer devices have agreed to share on this interface. For example, the VPI or VCI allocation on either peer device remains within the negotiated ranges. |
| <i>Local</i> | Options supported locally on this interface. |
| <i>Peer</i> | Options supported by the remote TDP peer device on this interface. |

Debugging ATM-Specific TDP Functions

router(config)#

```
debug tag-switching atm-tdp routes
```

- Debugs TDP requests over LC-ATM interfaces

router(config)#

```
debug tag-switching atm-tdp states
```

- Details TVC state transition debugging

There should be no need to use these debugging commands under usual circumstances.

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The **debug tag-switching atm-tdp routes** command displays information about the state of the routes for which VCI requests are being made.

The **debug tag-switching atm-tdp states** command displays information about LVC state transitions as they occur.

Summary

Cisco IOS software includes a large list of **show** commands that can ease troubleshooting of MPLS networks. Some commands shown in this section are:

- **show tag-switching atm-tdp summary**
- **show tag-switching atm-tdp bindings**
- **show tag-switching atm-tdp capability**

There are also many debugging commands that can help troubleshoot a problem when **show** commands are not sufficient. Debugging commands should be used with extreme caution.

Lesson Review

1. Which command would you use to display the LC-ATM capabilities of your device?
2. What is the unidirectional label allocation on an LC-ATM interface?
3. How can you identify an ATM switch by looking at the **show tag-switching atm-tdp bindings** printout?
4. How can you display Label Switched Paths that haven't been fully established yet?

Summary

After completing this lesson, you should be able to perform the following tasks:

- Configure cell-mode MPLS on ATM interfaces on IOS platforms
- Configure cell-mode MPLS on ATM VP on IOS platforms
- Monitor and troubleshoot cell-mode MPLS on IOS platforms

